Complete Summary

GUIDELINE TITLE

Guideline for management of postmeal glucose.

BIBLIOGRAPHIC SOURCE(S)

International Diabetes Federation (IDF). Guideline for management of postmeal glucose. Brussels, Belgium: International Diabetes Federation (IDF); 2007 Oct. 29 p. [146 references]

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

- Type 1 diabetes
- Type 2 diabetes (diabetes mellitus)
- Postprandial hyperglycemia (postmeal elevated glucose)
- Impaired glucose tolerance (IGT)
- Cardiovascular disease

GUIDELINE CATEGORY

Management
Treatment

CLINICAL SPECIALTY

Cardiology
Endocrinology
Family Practice
Internal Medicine

INTENDED USERS

Advanced Practice Nurses
Health Plans
Hospitals
Managed Care Organizations
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To present data from reports that describe the relationship between postmeal glucose and the development of diabetic complications
- To assist clinicians and organizations in developing strategies to effectively manage postmeal glucose in people with type 1 and type 2 diabetes, taking into consideration locally available therapies and resources

TARGET POPULATION

Patients with type 1 and type 2 diabetes

Note: Management of postmeal glucose in pregnancy has not been addressed in this guideline.

INTERVENTIONS AND PRACTICES CONSIDERED

Treatment/Management

1. Diet with low glycaemic load
    - Nutritional interventions
    - Physical activity
    - Weight control
2. Pharmacologic agents
    - Alpha-glucosidase inhibitors
    - Amylin analogs
    - Dipeptidyl peptidase-4 (DPP-4) inhibitors
    - Glinides
    - Glucagon-like peptides-1 (GLP-1) derivatives
    - Insulins (rapid acting, biphasic, and inhaled)
3. Self-monitoring of blood glucose (SMBG)
4. Emerging technologies
    - Continuous glucose monitoring
    - 1,5-Anhydroglucitol

MAJOR OUTCOMES CONSIDERED

- Change in plasma glucose 2 hours after eating
- Rate of development of microvascular complications
- Risks of postmeal hyperglycemia
- Change in hemoglobin A_{1c}
- Rate of glycaemic control

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The evidence used in developing this guideline included reports from key meta-analyses, evidence-based reviews, clinical trials, cohort studies, epidemiological studies, animal and basic science studies, position statements and guidelines (English language only).

A scientific writer with knowledge of diabetes obtained relevant reports through a computerized search of the literature using PubMed and other search engines; scanning of incoming journals in the medical library and review of references in pertinent review articles, major textbooks and syllabi from national and international meetings, on the subjects of diabetes, using relevant title and text words (e.g. postprandial, postmeal, hyperglycaemia, mealtime, self-monitoring, oxidative stress, inflammation) as search criteria. Evidence relating to both postmeal and postchallenge plasma glucose was reviewed and cited as appropriate. A review of recent guidelines, position statements and recent articles not identified in the universal search was also conducted to obtain additional information that was potentially applicable to the questions. An electronic database was created to include full reference information for each report; abstracts for most of the reports were included in the database. Members of the Steering Committee were asked to identify any additional reports or publications relevant to the questions.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Evidence-Grading Criteria*

Level	Type of Evidence
1++	• High-quality meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs with a very low risk of bias
1+	• Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1–	• Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
2++	• High-quality systematic reviews of case-control or cohort studies • High-quality case control or cohort studies with a very low risk of confounding bias and a high probability that the relationship is causal
2+	• Well-conducted case-control or cohort studies with a low risk of confounding bias or chance and a moderate probability that the relationship is causal • Well-conducted basic science with low risk of bias
2–	Case-control or cohort studies with a high risk of confounding bias or chance and a significant risk that the relationship is not causal
3	Non-analytic studies (for example case reports, case series)
4	Expert opinion

*From the Scottish Intercollegiate Guidelines Network. *Management of Diabetes*: A national clinical guideline. November, 2001.

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Key reports, whether supportive or not, were included and summarized based on their relevance to the questions to be addressed by this document. The evidence was graded according to criteria presented above in the "Rating Scheme for the Strength of the Evidence" field. The evidence cited to support the recommendations was reviewed by two independent external reviewers who were not part of the Guideline Development Committee. Comments from the external reviewers were then reviewed by the Steering Committee.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The process involved a broadly based group of people, including people with diabetes, healthcare professionals from diverse disciplines and people from nongovernmental organizations. The project was overseen by a Steering Committee and input was provided by the entire Guideline Development Group.

As a basis for developing the recommendations, the Guideline Development Group addressed four questions relevant to the role and importance of postmeal hyperglycaemia in diabetes management.

Evidence statements were compiled based upon review of the selected reports. These statements and supporting evidence were sent to Steering Committee members for their review and comment.

The Guideline Development Committee met to discuss the evidence statements and supporting data and to develop the recommendations. A recommendation was made according to the level of scientific substantiation based on evidence ratings whenever possible. However, when there was a lack of supporting studies, the Steering Committee formulated a consensus recommendation.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The draft guideline was sent out for wider external review to International Diabetes Federation (IDF) member associations, global and regional IDF elected representatives, interested professionals, industry and others on IDF contact lists, for a total of 322 invitations. Thirty-eight comments from 20 external reviewers from five of the seven IDF regions (Africa, South East Asia, Western Pacific, North America, Europe) were received. These comments were reviewed by the Steering Committee and considered in developing the final document.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The levels of evidence (1-4) are defined at the end of the "Major Recommendations" field.

Is Postmeal Hyperglycaemia Harmful?

Major Evidence Statement
• Postmeal and postchallenge hyperglycaemia are independent risk factors for macrovascular disease. **[Level 1+]**
Other Evidence Statements
• Postmeal hyperglycaemia is associated with increased risk of retinopathy. **[Level 2+]** • Postmeal hyperglycaemia is associated with increased carotid intima-media thickness (IMT). **[Level 2+]** • Postmeal hyperglycaemia causes oxidative stress, inflammation and endothelial dysfunction. **[Level 2+]** • Postmeal hyperglycaemia is associated with decreased myocardial blood volume and myocardial blood flow. **[Level 2+]** • Postmeal hyperglycaemia is associated with increased risk of cancer. **[Level 2+]** • Postmeal hyperglycaemia is associated with impaired cognitive function in elderly people with type 2 diabetes. **[Level 2+]**

Recommendation
Postmeal hyperglycaemia is harmful and should be addressed.

Is Treatment of Postmeal Hyperglycaemia Beneficial?

Evidence Statements
• Treatment with agents that target postmeal plasma glucose reduces vascular events. **[Level 1-]** • Targeting both postmeal and fasting plasma glucose is an important strategy for achieving optimal glycaemic control. **[Level 2+]**

Recommendation
Implement treatment strategies to lower postmeal plasma glucose in people with postmeal hyperglycaemia.

Which Therapies Are Effective in Controlling Postmeal Plasma Glucose?

Evidence Statements
• Diets with a low glycaemic load are beneficial in controlling postmeal plasma glucose. **[Level 1+]** • Several pharmacologic agents preferentially lower postmeal plasma glucose. **[Level 1++]**

Recommendation
A variety of both non-pharmacologic and pharmacologic therapies should be considered to target postmeal plasma glucose.

What Are the Targets for Postmeal Glycaemic Control and How Should They Be Assessed?

Evidence Statements
• Postmeal plasma glucose levels seldom rise above 7.8 mmol/l (140 mg/dl) in people with normal glucose tolerance and typically return to basal levels two to three hours after food ingestion. **[Level 2++]** • International Diabetes Federation (IDF) and other organizations define normal glucose tolerance as <7.8 mmol/l (140 mg/dl) two hours following ingestion of a 75-g glucose load. **[Level 4]** • The two-hour timeframe for measurement of plasma glucose concentrations is recommended because it conforms to guidelines published by most of the leading diabetes organizations and medical associations. **[Level 4]** • Self-monitoring of blood glucose (SMBG) is currently the optimal method for assessing plasma glucose levels. **[Level 1++]** • It is generally recommended that people treated with insulin perform SMBG at least three times per day; SMBG frequency for people who are not treated with insulin should be individualized to each person's treatment regimen and level of control. **[Level 4]**

Recommendation
• Two-hour postmeal plasma glucose should not exceed 7.8 mmol/l (140 mg/dl) as long as hypoglycaemia is avoided. • Self-monitoring of blood glucose (SMBG) should be considered because it is currently the most practical method for monitoring postmeal glycaemia. • Efficacy of treatment regimens should be monitored as frequently as needed to guide therapy towards achieving postmeal plasma glucose target.

Table: Glycaemic Goals for Clinical Management of Diabetes

HbA_{1c}	<6.5%
Premeal (fasting)	5.5 mmol/l (<100 mg/dl)
2-hour postmeal	7.8 mmol/l (<140 mg/dl)

Conclusions

There is a strong association between postmeal and postchallenge glycaemia and cardiovascular risk and outcomes in people with normal glucose tolerance, IGT and diabetes, as well as an association between postmeal hyperglycaemia and oxidative stress, inflammation, carotid IMT and endothelial dysfunction, all of which are known markers of cardiovascular disease. Furthermore, a growing body of evidence shows that postmeal hyperglycaemia may also be linked to retinopathy, cognitive dysfunction in elderly people with type 2 diabetes, and certain cancers.

Because there appears to be no glycaemic threshold for reduction of complications, the goal of diabetes therapy should be to achieve glycaemic status as near to normal as safely possible in all three measures of glycaemic control, namely HbA_{1c}, fasting premeal and postmeal plasma glucose. Within these parameters, and subject to the availability of therapies and technologies for treating and monitoring postmeal plasma glucose, a two-hour postmeal plasma glucose goal of <7.8 mmol/l (140 mg/dl) is both reasonable and achievable.

Regimens that target both fasting and postmeal glycaemia are needed to achieve optimal glucose control. However, optimal glycaemic control cannot be achieved without adequate management of postmeal plasma glucose. Therefore, treatment of fasting and postmeal hyperglycaemia should be initiated simultaneously at any HbA_{1c} level. Although cost will remain an important factor in determining appropriate treatments, controlling glycaemia is ultimately much less expensive than treating the complications of diabetes.

Definitions:

Evidence-Grading Criteria*

Level	Type of Evidence
1++	• High-quality meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs with a very low risk of bias
1+	• Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1–	• Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias

Level	Type of Evidence
2++	• High-quality systematic reviews of case-control or cohort studies • High-quality case control or cohort studies with a very low risk of confounding bias and a high probability that the relationship is causal
2+	• Well-conducted case-control or cohort studies with a low risk of confounding bias or chance and a moderate probability that the relationship is causal • Well-conducted basic science with low risk of bias
2–	Case-control or cohort studies with a high risk of confounding bias or chance and a significant risk that the relationship is not causal
3	Non-analytic studies (for example case reports, case series)
4	Expert opinion

*From the Scottish Intercollegiate Guidelines Network. *Management of Diabetes*: A national clinical guideline. November, 2001.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Effective management of postmeal glucose in people with type 1 and type 2 diabetes

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

Although the literature provides valuable information and evidence regarding this area of diabetes management, given the uncertainties regarding a causal

association between postmeal plasma glucose and macrovascular complications, as well as the utility of self-monitoring of blood glucose (SMBG) in non-insulin-treated people with type 2 diabetes, additional research is needed to clarify our understanding in these areas. Logic and clinical judgment remain critical components of diabetes care and implementation of the guideline recommendations.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness
Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

International Diabetes Federation (IDF). Guideline for management of postmeal glucose. Brussels, Belgium: International Diabetes Federation (IDF); 2007 Oct. 29 p. [146 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2007 Oct

GUIDELINE DEVELOPER(S)

International Diabetes Federation

SOURCE(S) OF FUNDING

Not stated

GUIDELINE COMMITTEE

Guideline Development Committee

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Steering Committee: Antonio Ceriello, *Chair*, Coventry, UK; Stephen Colagiuri, Sydney, Australia; John Gerich, Rochester, United States; Jaakko Tuomilehto, Helsinki, Finland

Development Group: Monira Al Arouj, Kuwait; Clive Cockram, Hong Kong, PR China; Jaime Davidson, Dallas, United States; Colin Dexter, Oxford, United Kingdom; Juan Jose Gagliardino, Buenos Aires, Argentina; Stewart Harris, London, Canada; Markolf Hanefeld, Dresden, Germany; Lawrence Leiter, Toronto, Canada; Jean-Claude Mbanya, Yaoundé, Cameroon; Louis Monnier, Montpellier, France; David Owens, Cardiff, United Kingdom; A Ramachandran, Chennai, India; Linda Siminerio, Pittsburgh, United States; Naoko Tajima, Tokyo, Japan

Medical Writer: Christopher Parkin, MS, Indianapolis, USA

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Members of the Guideline Development Committee have declared relevant dualities of interest in the topic and in relationships with commercial enterprises, governments and non-governmental organizations. No fees were paid to the Guideline Development Committee members in connection with the current activity.

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the International Diabetes Federation Web site.

Print copies: Available from IDF Executive Office: International Diabetes Federation, Avenue Emile de Mot 19, B-1000 Brussels, Belgium; Email: communications@idf.org.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Guide for guidelines. A guide for clinical guideline development. 2003. 35 p. Electronic copies: Available in Portable Document Format (PDF) from the International Diabetes Federation Web site.

Print copies: Available from IDF Executive Office: International Diabetes Federation, Avenue Emile de Mot 19, B-1000 Brussels, Belgium; Email: communications@idf.org.

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI Institute on March 16, 2009.

COPYRIGHT STATEMENT

DISCLAIMER

NGC DISCLAIMER

The National Guideline Clearinghouse™ (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the NGC Inclusion Criteria which may be found at http://www.guideline.gov/about/inclusion.aspx .

NGC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI Institute, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.

Date Modified: 6/1/2009